## REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-20 are pending in this application. Claims 1, 3, 6, 7, 9, 10, 12, 16, and 18-20 are amended by the present amendment.

In the outstanding Office Action dated November 14, 2008, Claims 1-20 were rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent 5,686,665 to Hara et al. (hereinafter "Hara"). Applicant respectfully traverses that rejection.

Amended Claim 1 is directed to a device for measuring dynamic matrix sensitivity of an inertia sensor. The device includes, in part, a motion generating machine for inducing a motion including at least one of a translational motion and a rotational motion. A degree of freedom of the motion is N ($1 \leq N \leq 6$, and N is an integer). The device also includes a unit subject to calibration provisionally fixed on a table of the motion generating machine, constituted by at least one of an acceleration measuring unit, an angular velocity measuring unit and an angular acceleration measuring unit. A degree of freedom of detection is M ($1 \leq M \leq 6$, and M is an integer). Additionally, the device includes output means for fetching an output from the unit subject to calibration, one or more light reflectors, a displacement measuring unit enabled to grasp a multidimensional motion by using a laser interferometer formed by irradiating the one or more light reflectors with laser beams from as many directions, and a processing unit for calculating an M×N dynamic sensitivity matrix $S_{p,q}(\omega)$ of the unit subject to calibration based on an output from the unit subject to calibration when the motion generating machine is vibrated by a vibration vector $(a_{i,x1}(j\omega t), a_{i,x2}(j\omega t), \ldots, a_{i,xN}(j\omega t)))$ ($1 \leq i \leq N$, $j$ is an imaginary unit, $\omega = 2\pi f$, and f is a frequency of vibration) and a data indicating a state of the multidimensional motion obtained from the displacement measuring unit. Furthermore, the device includes displaying means to display or a

transmitting means to transmit an output of the processing unit and output of the unit subject to calibration.

According to a non-limiting embodiment of Claim 1, there are six degrees of freedom of a motion in an engineering space. Of the six degrees, three are degrees of freedom in a translational motion and three are degrees of freedom in a rotational motion.[1] Therefore, the device according to this embodiment advantageously considers six degrees of motion which is the largest value of the degrees of freedom in the accelerometer which detects a motion, and the largest value of the degrees of freedom in the motion generating machine.

According to an embodiment of Claim 1, a unit subject to calibration may be provisionally fixed on the table of the motion generating machine. The motion generating machine may induce at least one of a translational motion and a rotational motion, wherein a degree of freedom of the generated motion is N, where $1 \leq N \leq 6$ and N is an integer. Further, a degree of freedom of detection is M, where $1 \leq M \leq 6$ and M is an integer.

In this example, the motion generating machine may be vibrated by a vibration vector $(a_{i,x1}(j\omega t), a_{i,x2}(j\omega t), \ldots, a_{i,xN}(j\omega t))$, where $1 \leq i \leq N$, $j$ is an imaginary unit, $\omega = 2\pi f$, and f is a frequency of vibration. An embodiment of Claim 1 may calculate an $M \times N$ dynamic sensitivity matrix $S_{p,q}(\omega)$ of the unit subject to calibration based on an output from the unit subject to calibration when the motion generating machine is vibrated. Further, data indicating a state of a multidimensional motion may be obtained by a displacement measuring unit. The unit subject to calibration may be calibrated when the values of all the components of the $M \times N$ dynamic sensitivity matrix $S_{p,q}(\omega)$ are obtained.

For example, in a case where a unit subject to calibration is a one-axis accelerometer and the accelerometer is calibrated by using a three-dimensional motion generating machine, the $M \times N$ dynamic sensitivity matrix $S_{p,q}(\omega)$ may be expressed by $(S_{xx}, S_{xy}, S_{xz})$, which

[1] Published specification at paragraph [0168].

respectively represent a sensitivity of the accelerometer in a normal axis direction, a cross sensitivity expressing the relation of the X axis output signal to the Y axis input component of the acceleration, and a cross sensitivity expressing the relation of the X axis output signal to the Z axis input component of the acceleration.[2]

For example, in the case where an embodiment of Claim 1 includes a three-dimensional motion generating machine, an X axis output voltage of an accelerometer may be calibrated as follows:

$$a_{out,x}(j\omega t) = S_{xx} \cdot a_{ix}(j\omega t) + S_{xy} \cdot a_{iy}(j\omega t) + S_{xz} \cdot a_{iz}(j\omega t)$$

Referring to the terms on the right side of the equation, a variation of the X axis input component ($=a_{ix}(j\omega t)$) is multiplied by the sensitivity $S_{xx}$ representing its contribution in the first term, a variation of the Y axis input component ($=a_{iy}(j\omega t)$) is multiplied by the sensitivity $S_{xy}$ representing its contribution in the second term, and a variation of the Z axis input component ($=a_{iz}(j\omega t)$) is multiplied by the sensitivity $S_{xz}$ representing its contribution in the third term. Accordingly, an overall variation (X axis output voltage of the accelerometer) is obtained. Furthermore, assuming a linear response in the vicinity of an equilibrium position, an offset value may advantageously be ignored in calibration according to Claim 1.

Applicant respectfully submits that Hara fails to teach or suggest each of the features of Claim 1. For example, Applicant respectfully submits that Hara fails to teach or suggest a processing unit that calculates a matrix for calibration as a function of an angular frequency $\omega$ based on an output from the unit subject to calibration when the vibration vector expressed as the function of the angular frequency $\omega$ is applied to the accelerometer as the unit subject to calibration. Additionally, Applicant respectfully submits that Hara fails to teach or suggest a motion generating unit inducing motion having N degrees of freedom of motion, where $1 \leq N$

[2] Published specification at paragraphs [0098] and [0170]-[0173].

$\leq 6$, and N is an integer, and Hara also fails to teach or suggest a unit subject to calibration having M degrees of freedom of motion, where $1 \leq M \leq 6$, and M is an integer.

Hara discusses a dynamic amount detector that generates correction information for correcting an installation error in an accelerometer for preventing the effects of hand shaking in a camera.[3] According to Hara, the accelerometer includes a detecting means which has a plurality of detection axes and detects dynamic amounts of acceleration imparted in the respective directions of the detection axes.

Furthermore, Hara indicates that output voltages $V_{xxu}$, $V_{yxu}$ and $V_{zxu}$ of a detection device (accelerometer) have a relation expressed by the equation (10) among direct-current voltage components $V_{xDC}$, $V_{yDC}$ and $V_{zDC}$.[4] According to Hara, all of the output voltages $V_{xxu}$, $V_{yxu}$ and $V_{zxu}$ of the detection device are direct-current components because all of $V_{xDC}$, $V_{yDC}$ and $V_{zDC}$ are direct-current components.[5] Furthermore, according to Hara's equations (10) and (11), none of the dynamic amounts imparted in the detection-axis directions of the accelerometer is given as the function of angular frequency, the correction method for the accelerometer disclosed by Hara is based on an amplitude value alone, and the detection sensitivity coefficients $S_{xx}$, $S_{xy}$, $S_{xz}$, $S_{yx}$, $S_{yy}$, $S_{yz}$, $S_{zx}$, $S_{zy}$, and $S_{zz}$ are not expressed as the function of angular frequency.

Therefore, Applicant respectfully submits that Hara fails to teach or suggest "a processing unit for calculating an M×N dynamic sensitivity matrix $S_{p,q}(\omega)$ of the unit subject to calibration based on an output from the unit subject to calibration when the motion generating machine is vibrated by a vibration vector $(a_{i,x1}(j\omega t), a_{i,x2}(j\omega t), \ldots, a_{i,xN}(j\omega t)))$ $(1 \leq i \leq N$, $j$ is an imaginary unit, $\omega = 2\pi f$, and f is a frequency of vibration) and a data indicating a

[3] Hara at column 1, lines 40-52.
[4] Hara at column 6, lines 27–30, and at column 6, line 59 to column 7, line 29.
[5] Hara at column 6, line 59 to column 7, line 9.

state of the multidimensional motion obtained from the displacement measuring unit," as recited in Claim 1.

Further, since a gravitational acceleration is used in the correction method disclosed by Hara, the direction of the acceleration is fixed in the disclosed method. In addition, since the disclosed method is actually intended to be applied to a camera, Hara fails to indicate or otherwise suggest that the acceleration is applied to the accelerometer in every direction.

In addition, although Hara mentions the acceleration, angular velocity and angular acceleration as dynamic amounts imparted in the directions of the detection axes of the accelerometer, Hara fails to disclose a method of inducing a detection sensitivity coefficient in a case where any dynamic amount other than the three-axis translational acceleration is applied.

Accordingly, Applicant respectfully submits that Hara also fails to teach or otherwise suggest "a motion generating machine for inducing a motion including at least one of a translational motion and a rotational motion, wherein a degree of freedom of the motion is a N ($1 \leq N \leq 6$, and N is an integer)," as required by Claim 1.

Therefore, Applicant respectfully requests the rejection of Claims 1-20 under 35 U.S.C. § 103(a) be withdrawn.

Thus, it is believed that Claims 1-20 are allowable.

Consequently, in light of the above discussion and the present amendment, this application is believed to be in condition for allowance, and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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